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ABSTRACT

A study investigated whether student non-comprehension strategy use would vary according to learning environment by looking at the tutoring session--a more intimate learning situation than the classroom. Through collection and analysis of five tape-recorded tutoring sessions, results indicated that the eight undergraduate students were more likely to use non-comprehension strategies in a tutoring interaction. The types of non-comprehension strategies students used during the tutoring sessions were also examined. To better capture the unique dynamics of a tutoring session, an exploratory questionnaire was administered. Six tutor questionnaires and 11 students questionnaires were analyzed. Since questionnaires were completed at the end of every tutoring session that was taped, some participants completed more than one survey. Results indicated that all students and tutors appeared to be satisfied to some extent with the tutoring sessions. Overall, students felt their goals had been accomplished and learning had taken place. (Contains eight references and a table of data. Three appendixes present examples of strategies from the data set.) (RS)

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The use of non-comprehension strategies in tutoring sessions: A case study

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The use of non-comprehension strategies
in tutoring sessions: A case study

Abstract

This study was undertaken to examine if student non-comprehension strategy use would vary according to learning environment. Since previous research in this area has only explored non-comprehension strategy use in classrooms, this study attempted to look at a different and more intimate learning situation -- the tutoring session. Through collection and analysis of tape-recorded tutoring sessions, it was found that students were more likely to use non-comprehension strategies in a tutoring interaction. This study also examined the types of non-comprehension strategies students used during the tutoring sessions. To better capture the unique dynamics of a tutoring session, an exploratory questionnaire was administered. Results of the questionnaire are also addressed.

The use of non-comprehension strategies in tutoring sessions: A case study

Introduction

Research in instructional communication has more often than not focused on the teacher. It is assumed that information is somehow disseminated from instructor to student and the result is either an increase or decrease in a student's test score. Classroom communication, however, is not such a cut-and-dried issue. Learning is often a highly negotiated process with both student and teacher continually re-defining the learning situation through their use of communicative strategies.

Given that classroom communication is a shared activity between instructor and pupil, it is surprising that a large portion of instructional communication studies focus primarily on teacher communication and little work has been done to explore the student's role as a communicator within the classroom. It seems crucial that to understand classroom communicative behavior, we must view learning as a dialogue between teacher and student.

An important area of research that has recently begun to examine the student's role as communicator in classroom settings has been addressed by Kendrick and Darling (1990), and Darling (1989, 1990). As Kendrick and Darling discovered through their work, any particular message or behavior that occurs in a learning situation can be understood in many different ways "(e.g., as relating to pedagogical, social, and/or pragmatic dimensions of the classroom) (p. 15)." This can make student non-comprehension problems likely and the need to address them salient (Kendrick & Darling, p. 15). According to Darling (1989):

> "non-comprehension problems refer to situations in which an individual is having trouble understanding the meaning of an utterance (p. 35)."

A non-comprehension strategy, then, is a verbal tactic used when the student attempts to gain clarification. A clarification attempt can then result through the instructor's choice of an appropriate clarification device. Students can use several tactics for indicating an understanding problem and each of these tactics calls for an immediate signalling of the problem (Darling, 1990, p. 3). The tactics used can also be viewed as implicitly placing the responsibility for clarification on either the teacher or the student (Darling, 1990, p. 3).

When Kendrick and Darling undertook a research project to look more closely into students' use of non-comprehension strategies in the classroom they found a variety of non-comprehension problems. Results from their investigation suggest that:

> "students experience different types of understanding problems and that they use a variety of tactics in coping with those problems. Tactic use is related not only to the problem type but also to the situation within which the problem occurs (Kendrick & Darling, p. 27)."

According to Garner (1990), it is clear from recent research that strategic behavior (such as clarification requests) enhances learning. Effective learners appear to know when they need to be strategic and when they do not, claims Garner (p. 526). She has argued, however, that:

> "use and failure to use strategies are not fruitfully studied without consideration of setting because a theory of setting reminds us that when context varies, the nature of strategic activity often varies as well (Garner, p. 526)."

Kendrick and Darling, and Darling (1989) have explored students' use of non-comprehension strategies in classroom settings and their findings suggest that

strategy use tends to vary in relation to the problem type and distinguishing features of the class (Kendrick & Darling, p. 27). For example, Kendrick and Darling collected survey data from 124 college students and found an almost perfect inverse linear relationship between size of classroom where the comprehension problem occurred and the number of tactics students used to seek clarification. As size increased, the number of tactics decreased and vice versa, according to Kendrick and Darling (p. 24). Kendrick and Darling suggest that there is a relationship between class size and how much students are willing to do to gain clarification.

In 1989, Darling collected data on student use of non-comprehension strategies through a series of unobtrusive non-participant observations of three undergraduate Speech Communication classrooms. One class was primarily a lecture course of 80 students. The other two classes were smaller (18 and 28 students) and were characterized by the small group discussion method. Observations took place three times a week in each 50-minute class during an academic quarter. Through her observation of these classes over a quarter, Darling extracted 68 incidents of student use of non-comprehension strategies from the data.

Kendrick and Darling caution researchers from treating all understanding problems as similar. That approach could hinder "our ability to see, use and/or invent viable solutions for coping with such problems (Kendrick & Darling, p. 27)." So far, Kendrick and Darling have only conducted their research in the classroom. This present study attempted to broaden their findings by investigating the use of non-comprehension strategies in a related, but different, learning situation -- the tutoring

session. It appears that the one-on-one (or small group) context of a tutoring session would affect strategy use, quite possibly increasing the number of student's tactics.

It is important to take this next step and look at other educational settings beyond the classroom in order to analyze the effect of environment on students' choice of non-comprehension strategies. As Garner explains, strategy use is embedded in context -- it does not occur in a vacuum. In her report on the students' perceptions of responsibility for clarification efforts in classrooms, Darling (1990) found that in the classroom situation students tend to "be generally passive, opting to ignore communication problems or select tactics that require that the teacher do much of the work (p. 22)." However, it seems likely that a student would take a more active role in a tutoring session, where his/her perception of responsibility for clarification may seem greater. The environmental factors surrounding a tutoring session would probably have an impact on a student's choice of non-comprehension strategies also. Students may feel they have more time to ask questions in a tutoring session and therefore, may increase their participation in the learning process. Their strategy selection may also be enhanced or hindered by the student's perception of privacy available during the session.

In undertaking this exploratory project, a naturalistic approach for studying non-comprehension strategies was chosen so that naturally-occurring conversation between students and tutors could be analyzed. This approach approximates what Edwards and Mercer (1987) call 'insightful observation'. This approach is best represented by the work of Douglas Barnes, according to Edwards and Mercer. They

explain that Barnes' general intention is to relate observed features of classroom discourse to pupil's learning processes (Edwards & Mercer, p. 26). Barnes undertakes 'insightful observation' by "observing, and tape-recording, instances of discourse in lessons and then commenting on what appears to be taking place (Edwards & Mercer, p. 26)." Iran-Nejad, McKeachie, & Berliner (1990) suggest that a response is more easily investigated if it "occurs in simultaneous functioning with other responses with which it is naturally integrated (p. 511)."

Descriptive Framework

In order to analyze the series of tape-recorded tutoring sessions, it was necessary to choose an analytic framework that would best facilitate the collection and categorization of non-comprehension strategies. When Darling (1989) analyzed student communication behavior in her study of Speech Communication classrooms, she specifically focused on the clarification requests that college students used to signal difficulty comprehending what the teacher had said. In order to classify the non-comprehension problems she recorded, Darling adapted Jordan and Fuller's (1975) two-part system for classifying non-comprehension strategies. Jordan and Fuller originally developed their classification scheme to analyze non-comprehension problems experienced during conversation attempts by two individuals who do not share a common first language. Darling, however, saw utility in adapting Jordan and Fuller's (1975) framework to the classroom because the adaptation would:

> "more generally ... allow for the examination of particular types of student verbal messages, requests for clarification that indicate problems of comprehension (Darling, 1989, p. 36)."

The original Jordan and Fuller (1975) system consisted of two classifications of non-comprehension strategies. The first strategy employs an indication of the preferred clarification device in the form of a binary choice test. This type of strategy generally comes in the form of a request for acceptance or rejection of a proposal or in the form of a short-answer request. Examples of this strategy are statements like: "When you say that, you're talking about World View I aren't you?" and "How many stages did you say there were in the Dewey model (Darling, 1989, p. 35)?"

Jordan and Fuller's (1975) second strategy in their classification framework indicates the need for clarification, but doesn't point to a preferred device (Darling, 1989). These strategies leave the choice of a clarification device up to the respondent. An example of this strategy might be: "I don't understand what you mean by author intention (Darling, 1989, p. 35-36)."

Darling found that Jordan and Fuller's (1975) classification system could be used in analyzing classroom non-comprehension strategies with some adaptation. Darling used not only the two-part system (which she labeled as 1) focused and directive strategies, and 2) focused and non-directive strategies), but added a third important element to the classification system. This third category, called "personally qualified flags," was developed by Darling because some of her observations "contained neither a clear focus on the nature of the comprehension problem nor direction with respect to a clarification device (p. 38)." She found these strategies were dominated by the speaker's references to him/herself, as well as rationales for

the request. Darling's (1989) framework was adopted for use in this case study based on her success in being able to account for all data collected with the system.

Because this study looks at the specific case of non-comprehension strategies occurring in a tutoring setting, as opposed to a classroom setting, three general questions can be addressed:

RQ #1: Will students' tend to use more non-comprehension strategies in a tutoring session as compared to a traditional classroom setting?

RQ #2: Which non-comprehension strategies are students most likely to use in tutoring sessions?

RQ #3: To what extent is Darling's (1989) classroom classification system useful in analyzing and describing student non-comprehension strategies in tutoring sessions?

Methods and Procedures

Using Darling's (1989) framework, a typological analysis of data was undertaken. Data were collected through a series of visits to one of the undergraduate tutoring centers at a large midwestern university. Although students and tutors often met during appointed times, students were also encouraged to "drop-in" during office hours if they needed additional help in specific subject areas. The researcher tape-recorded eight separate tutoring sessions over a two-week period (seven sessions with Tutor A and one session with Tutor B). Due to the inaudibility of two of the sessions, only five tapes were used as data. The tutoring sessions dealt with several different 100-level chemistry and math courses.

Both of the tutors who agreed to participate in the study were male graduate students at the university. Four of the students who participated were male and 4

were female (two female students participated in more than one tutoring session). Six of the students were freshmen and three were sophomores. Often a tutor would meet with only one student, but it was not uncommon for a tutor to hold a session with up to four students.

The tutoring sessions took place in and around the tutoring center. The tutoring center was comprised of a large open area with several long tables available for individual and group work. There were also some "conference" rooms on the periphery. With the exception of two sessions, taped interactions took place amid the general activity of the center. One chemistry tutorial was held in a private meeting room across the hall from the tutoring center, and the math session was held in the open area of the center, but after general center hours.

The researcher was introduced to each study group as someone who was interested in looking at communication patterns in tutoring sessions. Although the researcher was seated nearby, the recorded tutoring sessions appeared to progress in a "naturally-occurring" manner and participants did not seem inhibited by the recording equipment.

The tutoring session tapes were reviewed by the researcher and any student request for clarification that was audible on tape was chronologically noted. Only verbal indications of non-comprehension were itemized. These data were then analyzed and categorized according to the typology Darling (1989) developed. Decisions on categorization were based not only on the written transcript of the non-comprehension incident, but also on the intonation and inflection used by the student

when signalling non-comprehension. The context the non-comprehension occurred in was also taken into account when analyzing the data. The following are several examples of non-comprehension strategies that were extracted from the tutoring sessions and used for analysis:

"I don't understand -- how does it get to be negative then?"
"What's the other strong acid?"
"When is Y equal to 0?"

Darling's (1989) three-part system of classification proved to be an appropriate framework since all instances of student non-comprehension strategies were readily accounted for by using this system.

Following each tutoring interaction, an exploratory survey was distributed to all participants in the session. The purpose of the survey was to examine the dynamics of each session. Using a six-point Likert scale, both students and tutors were questioned on their satisfaction with the session, feelings of accomplishment, and opinion on whether learning took place during the session. The questionnaire was also constructed to look more closely at environmental factors of the tutoring session. For example, did the participants feel that they had sufficient time and privacy to accomplish their goals? The questionnaire was also designed to tap into the students' and tutors' beliefs about issues of responsibility during the tutoring session. Questions were targeted at feelings of role expectations and responsibility for communicative success.

Results

Total strategies. A total of 369 non-comprehension strategies were collected as a result of taping the tutoring sessions. Results, broken down by type of strategy used are displayed in Table 1. These results appear to support the idea that students would be more likely to use any type of non-comprehension strategy in a tutoring session than in a classroom. Darling (1989) recorded only 68 instances of strategy use after observing three classrooms over an entire academic quarter. In analyzing the observations of only five (one-on-one or small group) tutoring sessions, 369 total strategies were recorded and classified. Although environmental factors will vary in each learning situation, it seems apparent that students are more likely to express non-comprehension in the more intimate setting of a tutoring session.

Focused and directive. A total of 236 strategies (64%) were classified as focused and directive. The focused and directive clarification strategy draws attention to the comprehension problem and then indicates the type of preferred clarification device. (See Appendix A for examples of this strategy from the data set.)

Focused and non-directive. A total of 117 strategies (32%) were categorized as being focused but non-directive. As Darling (1989) explains, these strategies focus attention on the comprehension trouble spot, but do not provide direction for a preferred clarification device from the respondent. (See Appendix B for examples of this strategy from the data set.)

Personally qualified flags. A total of 16 strategies (4%) fell into this category. A personally qualified flag is an unclear attempt by the student to solve a problem of non-comprehension. These strategies neither focus direct attention on the problem

nor offer a request for a particular clarification device. These strategies also often include self-references and rationales. (See Appendix C for examples of this strategy from the data set.)

Tutoring session satisfaction survey. Six tutor questionnaires and 11 student questionnaires were analyzed. Since questionnaires were completed at the end of every tutoring session that was taped, some participants were asked to complete more than one survey.

All students and tutors appeared to be satisfied to some extent with the tutoring sessions. All tutor questionnaires evaluated show the tutor felt something was accomplished during the session and learning did take place during the session. All but one student duplicated the response of the tutor's. That student disagreed "somewhat" that something was accomplished during the session.

Questions targeted at environmental factors of the tutoring session yielded a varied response. In 66% [1] of the instances, the tutors strongly or somewhat agreed that they had plenty of time to accomplish their goals during the session. Despite the fact that tutoring was often held in a more "open" environment, tutor questionnaires show that they agree to some extent that the sessions were held in a manner that allowed privacy.

Students' responses to environmental factors fluctuated more than tutors' responses. Although 72% of the respondents at least somewhat agreed that there was enough time to accomplish goals, 27% of the students felt the time allocated for the session wasn't adequate. As to the issue of privacy, 54% felt the session was

held in a sufficiently private place; 36% either disagreed or disagreed somewhat that the surroundings were private enough; and 9% (one student) strongly disagreed on the privacy issue.

Feelings regarding role expectations in terms of learning goals, were varied for tutors, even though there were only two tutors surveyed across several sessions. In four instances, responses indicated the tutor believed only somewhat that the student's role is to acquire as much information as possible. One tutor indicated strong agreement that the student's role is to acquire as much information as possible. Questions targeted to analyze the tutor's own role perceptions also varied. Four of the responses indicated the tutors disagreed only somewhat that the tutor is primarily responsible for successful communication during the tutoring session. Also, in all instances, both tutors responded that they either strongly or somewhat agreed the tutor's role in the session is to help students develop their critical thinking abilities. The tutors did not agree on the tutor's role in student motivation across all environmental factors. One tutor report showed strong agreement that student motivation is the tutor's responsibility, two tutor responses indicated the responsibility was only somewhat the tutor's, two responses indicated the tutor somewhat disagreed that the tutor is responsible, and one tutor response indicated disagreement with the statement.

Given that only two tutors participated in this study, it is interesting to note the wide variety of responses recorded above. Role expectations appeared to vary as a result of each tutoring interaction. What this data reflects is the fact that each tutoring session was a unique event. It appears that tutors and students negotiated their roles

and expectations at each meeting, and created a two-sided "dialogue" specific to each learning episode.

Student's role expectations were also varied. Ten students (91%) indicated that the role of the student is to acquire as much information as possible. Students indicated a variety of responses regarding their belief that the tutor is responsible for successful communication during the session. Fifty-five percent only somewhat agreed with the statement, 27% strongly agreed, 9% somewhat disagreed, and 9% disagreed. Thirty-six percent of the student's surveyed strongly agreed that the tutor's role in the tutoring session was to help students develop their thinking abilities, 27% agreed, 27% somewhat agreed, and 9% disagreed. The majority of students (72%), agreed or somewhat agreed that it is the tutor's job to motivate students to learn, and 27% of the students disagreed with that statement.

Discussion

This study was undertaken to examine if student non-comprehension strategy use would vary according to learning environment. Since previous research in this area looked at strategy use in classrooms, this study attempted to look at a different and more intimate learning situation – the tutoring session. Through collection and analysis of recorded tutoring sessions it was discovered that students were more likely to use any type of non-comprehension strategy in a tutoring session. Three-hundred and sixty-nine strategies were recorded and analyzed from the tutoring sessions. Previous research has reported on the use of only 68 strategies in three classrooms over an academic quarter. Although a direct comparison cannot be made between

the classroom and the tutoring session through this study, it is apparent that the specific learning environment does have some effect on a student's use of non-comprehension strategies.

The 369 recorded strategies were then categorized according to strategy type. It was found that in 64% of the cases students used a focused and directive strategy. This strategy both points attention to the specific non-comprehension problem and indicates the preferred clarification device. This strategy is generally thought to be the most successful tactic because the respondent is given a clear indication of what the comprehension problem is and how he/she can help clarify the problem.

> "Given that the focused and directive strategies might be the hardest to use, it may be that individuals who are more skilled at communicating have become more adept at learning as well (Darling, 1989, p. 39)."

Since participation in the tutoring sessions is encouraged, but not mandatory, it may be likely that the students who do attend have come to the session with specific goals they want to accomplish by the end of the meeting. Therefore, it makes sense they would rely on the strategies they have found are most likely to help them achieve their learning goal. It might be interesting in the future to conduct a longitudinal study of several students involved in tutoring sessions to see if their use of strategies would change as a result of time, interaction with a tutor, and increased knowledge of subject matter.

The data also demonstrated that 32% of the non-comprehension strategies used were focused but non-directive. This strategy highlights the point of non-comprehension but offers no preference for a clarification device. Therefore, when a

student uses a focused but non-directive strategy, he/she is less likely to receive a satisfactory answer from the instructor. This type of strategy places more burden on the tutor because the tutor must not only acknowledge the non-comprehension problem of the student, but also somewhat blindly decide which clarification tactic to use. Focused but non-directive strategies force the tutor to assume more responsibility in the session because he/she has to try to "pull" the clarification device from the student. Results of the exploratory survey pointed out that only 9% of the respondents believed that the tutor is not, in some part, responsible for successful communication during the sessions.

Personally qualified flags were used only 4% of the time. This technique offers no focus or direction for clarification and often centers on the student and his/her rationale for why he or she is not "getting it." Even more so than the focused but non-directive strategy, the personally qualified flag leaves little room for successful clarification. Since the flag is student-centered, the tutor is often unable to understand the clarification request.

In reviewing the personally qualified flags used by students in the sessions, the flags most commonly occurred as an expression of student frustration with difficulty they were experiencing in comprehending material. In fact, when listening to the vocal intonation and inflection surrounding "flag statements" recorded, the flags seemed to be an attempt to "vent" frustration, but unfortunately in a way that offered the tutor little guidance in how to best clarify the material. The flags tended to appear more often when the students were less familiar with the course work (for example, when dealing

with a new concept just introduced in a class). It may be possible that students rely on flags when they haven't developed the "vocabulary" yet in a subject, so are unable to ask other, more pointed, questions.

Students may also rely on flags to signal motivational pitfalls in a particular subject area. For example, the majority of students (72%) surveyed in the study, indicated that they believed it was the tutor's job to motivate students to learn. Personally qualified flags may be used as an attempt to let the tutor know the student needs encouragement more than she/he needs actual clarification of the material.

Darling's (1989) classification framework proved to be an appropriate typology for tutoring session analysis. All instances of clarification attempts were accounted for under this system. The framework also proved to be successful to the extent that findings in this study appear to match trends in strategy use that were reported by Darling.

The results of an exploratory questionnaire that focused on student and tutor perceptions of accomplishment and role responsibility in the tutoring session were also addressed in this study. The survey was aimed at capturing some of the dynamics of the tutoring sessions. All students and tutors surveyed appeared to be satisfied to some extent with the tutoring sessions. Overall, students felt their goals had been accomplished and learning did take place.

The tutoring environment may have had some effect on the students' choice of strategies. Students' responses indicated that most students felt they had enough time to achieve their goals during the session. Several students, however, felt they

would have benefitted from more time. Non-comprehension strategy choice may reflect a students' ability to work comfortably and efficiently within the allotted time.

Interestingly, even though the tutoring center was an open, busy place, the majority of students felt they had adequate privacy during the session. This may be due to the fact that the students and tutors have somehow been able to "negotiate" their own "space" within the center and therefore are more likely to avoid outside distractions.

Finally, the questionnaire explored student perceptions of role responsibility in the sessions. The majority of students felt their role in the session was to gain as much information as possible. Tape-recorded data collected during the sessions appears to support this survey finding. A total of 369 non-comprehension strategies were used by students during the tutoring interactions. When this number is contrasted with the 68 instances of strategy use Darling (1989) found after recording three classrooms over an entire academic quarter, it is apparent that students are much more inclined to use strategies during a tutoring session, possibly as an information-gaining tactic.

Responses varied as to the students' perceptions of responsibility for successful communication and motivation for learning during the sessions. Most students indicated they had some role in achieving successful communication, however responses tended to vary as to the degree the student felt responsible. Non-comprehension strategy choice could be a reflection of the students' willingness to participate in the communication process.

comprehension strategy choice could be a reflection of the students' willingness to participate in the communication process.

Students did tend to indicate that they felt the role of the tutor in the sessions was to motivate students to learn. This reiterated what Darling (1989, 1990) and Kendrick & Darling found in their research. Students tended to take a less active role in the classroom and place the burden for clarification on the teacher. More than one-third of the strategies that students used in this study were focused and non-directive or personally qualified flags. Both of these strategies place the burden of choosing an appropriate clarification device on the tutor. This finding could be a reflection of a student's perception that he/she should take only a passive role in the learning process.

Although this study has illuminated trends in students' use of non-comprehension strategies in tutoring sessions, it should be noted that this analysis is limited in its scope. It is important in the future to explore these questions in a variety of academic settings and with larger numbers of students. Longitudinal research may also highlight how a student's use of non-comprehension strategies develops with experience. As Kendrick and Darling point out:

> "As we continue to study this phenomenon, we should develop a better understanding of the different problem types that teachers and students experience and better ways to observe and identify understanding problems in relation to other behavior (p. 28)."

Note

[1] Percentages rounded.

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TABLE 1

BREAKDOWN OF NON-COMPREHENSION STRATEGIES RECORDED

Focused and directive	236	64%
Focused and non-directive	117	32%
Personally qualified flags	16	4%
TOTAL RECORDED	369	

APPENDIX A

EXAMPLES OF FOCUSED AND DIRECTIVE STRATEGIES FROM THE DATA SET

"And that's the reason why you don't have a signal for this?"
"Wait -- so this is minus and this is plus?"
"Okay, K for F is an A?"
"Oh, so that would still be positive, right?"
"Oh, kind of a base is what's leftover of the acid?"
"You're gonna divide by 2?"
"Well, that means X is larger?"
"If it's close to water, then it won't dominate?"
"Oh, water will be like 1.10?"
"This one is a base and this one is a base?"
"So which is my KB?"
"But, I mean do you divide by KW?"
"What's the other strong acid?"
"So it's weak?"
"How would it peak down here?"
"So, you have two ethyls?"
"Oh, so there won't be any splitting?"
"You mean kilajewels are jewels?"
"So then you multiply -- no then you divide by 1,000 to get jewels?"
"So then you just put it back in the equation to get Delta G for the reaction?"
"Oh, so this equation is only for buffers?"
"What are polycrylic acids?"
"Now why is this zero?"
"So, covalent bonds are not salt?"
"Minus 5?"
"I'm talking about negative X to the third -- that's basically what you want me to graph --right?"

APPENDIX B

EXAMPLES OF FOCUSED AND NON-DIRECTIVE STRATEGIES FROM THE DATA SET

"Gee, what happened to the simple thing?"
"So, why did they give us this answer?"
"She said this is borderline. What's she talking about?"
"You would be thinking they would go together (trails off)..."
"So, basically, how would you find out?"

"Wait a minute -- but how do you know which one goes first?"
"Wait -- well, how did you know -- by comparison, how did you know that was too close?"
"So what do you do? Do you do that? KW?"
"See, I'm getting them confused, that's the whole thing. I don't know which one's my KA and which one's my KB and (giggle)?"
"Tell me, like I look at this...sometimes I can sort of figure it out but...not really though."
"Okay, if I was going to do this -- okay, first of all this is the data the master grams, micro weight, everything, moles -- okay, you would look at what would be the limitary agent -- you see what I'm saying?"
"I have no idea..."
"I don't know -- it's still not coming out right."

APPENDIX C

EXAMPLES OF PERSONALLY QUALIFIED FLAGS FROM THE DATA SET

"I don't understand -- well I had a -- I had a problem because they give you the formula and how do they expect you to find out if it's basic and then they give you the charts..."
"And for that test I didn't know -- it was kinda bright but it wasn't silverish, you know, like a mirror-type image -- it wasn't -- so I did the chromic test -- but over here it was something like this..."
"What happened when you could just tell if you had an H -- that's how I also distinguished, but now when they give you H - OH you're like what -- what is this?"
"Okay and now we gotta find the OH? Wouldn't that be the base? See, I look at the minus and I'm thinking, 'well this is a base,' and then I see the minus in the F and I'm like, 'wait a minute,' -- why do both negative?"
"Like my product or something was wrong -- but it seems like if my product was wrong they would -- they wouldn't say, 'wrong,' -- they would just say, 'product wrong -- minus something,' -- they wouldn't say, 'wrong.'"